width of the prediction unit, such as 1:n or n:1, partitions that are obtained by geometrically splitting the prediction unit, and partitions having arbitrary shapes.

[0049] A size of the partition type or the prediction unit of the coding unit may be determined according to whether split is performed on a current coding unit with a current depth or a lower depth.

[0050] When the partition type of the current coding is a symmetrical partition type, the symmetrical partition type of the current coding unit may include a partition having the same size as the current coding unit, and a partition obtained by dividing a height or width of the current coding unit by two. That is, a symmetrical partition type of a coding unit having a size of 2N×2N may include partitions of 2N×2N, 2N×N, or N×2N.

[0051] When the current coding unit is no longer split into coding units of a lower depth, the symmetrical partition type of the current coding unit may include partitions having the same size as the coding units of the lower depth. That is, when the current coding unit is a minimum coding unit that cannot be split into coding units of a lower depth and that is from among current maximum coding units, the symmetrical partition type of the current coding unit may include not only the partitions of 2N×2N, 2N×N, and N×2N but also may include a partition having a size of N×N.

[0052] Similarly, when the current coding unit is a coding unit of a lowest depth from among the current maximum coding units, the symmetrical partition type of the current coding unit may include not only the partitions of 2N×2N, 2N×N, and N×2N but also may include a partition having a size of N×N.

[0053] For example, when a coding unit having a current depth and a size of 2N×2N is split once and thus is divided into coding units having a lower depth and a size of N×N, intra prediction and inter prediction may be performed on the coding unit having the size of N×N by using the partition having the size of N×N. Thus, in order to avoid repetition of an unnecessary process, in a structure of hierarchical coding units according to the present exemplary embodiment, a partition type having a size of N×N may not be set to the coding unit having the size of 2N×2N.

[0054] However, when the current coding unit having the size of 2N×2N is the minimum coding unit, the current coding unit is no longer split into coding units having a size of N×N, so that the inter prediction or the intra prediction may be performed on the current coding unit by using partitions having a size of N×N. Thus, the partition type of the minimum coding unit having the size of 2N×2N may include the partitions of 2N×2N, 2N×N, N×2N, and N×N.

[0055] A prediction mode of the prediction unit may be at least one of an intra mode, a inter mode, and a skip mode. For example, prediction encoding in the intra mode and the inter mode may be performed on the partition of 2N×2N, 2N×N, or N×2N.

[0056] That is, in at least one of cases in which the current coding unit is not the minimum coding unit, in which the current coding unit is split into coding units of a lower depth, and in which the current coding unit is not the coding unit of a lowest depth from among the current maximum coding units, the inter prediction and the intra prediction which are performed by using the partition of N×N may be skipped.

[0057] However, when the current coding unit is the minimum coding unit, since the intra prediction and the inter prediction cannot be performed on a coding unit of a lower depth, the inter prediction and the intra prediction may be performed on the minimum coding unit by using the partitions of 2N×2N, 2N×N, N×2N, and N×N.

[0058] Also, the skip mode may be performed only on the partition of 2N×2N. The encoding is independently performed on one prediction unit in a coding unit, thereby selecting a prediction mode causing a least encoding error.

[0059] The video encoding apparatus **100** may also perform the transformation on the image data in a coding unit based not only on the coding unit for encoding the image data, but also based on a data unit that is different from the coding unit.

[0060] In order to perform the transformation in the coding unit, the transformation may be performed based on a transformation unit having a size smaller than or equal to the coding unit. For example, the transformation unit for the transformation may include a transformation unit for an intra mode and a transformation unit for an inter mode.

[0061] Similarly to the coding unit having a tree structure, the transformation unit in the coding unit may be recursively split into smaller sized regions. Thus, residual data in the coding unit may be split according to the transformation having the tree structure according to transformation depths.

[0062] A transformation depth indicating the number of splitting times to reach the transformation unit by splitting the height and width of the coding unit may also be set in the transformation unit. For example, in a current coding unit of 2N×2N, a transformation depth may be 0 when the size of a transformation unit is also 2N×2N, may be 1 when the size of the transformation unit is thus N×N, and may be 2 when the size of the transformation unit is thus N/2×N/2. That is, the transformation unit may be set according to a hierarchical tree structure according to the hierarchical characteristics of transformation depths.

[0063] Encoding information according to coding units corresponding to a coded depth uses not only information about the coded depth, but also about information related to prediction encoding and transformation. Accordingly, the coding unit determiner **120** not only determines a coded depth having a least encoding error, but also determines a partition type in a prediction unit, a prediction mode according to prediction units, and a size of a transformation unit for transformation.

[0064] Coding units according to a tree structure in a maximum coding unit and a method of determining a partition, according to exemplary embodiments, will be described in detail below with reference to FIGS. **3** through **13**.

[0065] The coding unit determiner **120** may measure an encoding error of deeper coding units according to depths by using Rate-Distortion Optimization based on Lagrangian multipliers.

[0066] The output unit **130** outputs the image data of the maximum coding unit, which is encoded based on the at least one coded depth determined by the coding unit determiner **120**, and information about the encoding mode according to the coded depth, in bitstreams.

[0067] The encoded image data may be obtained by encoding residual data of an image.

[0068] The information about the encoding mode according to coded depth may include information about the coded depth, about the partition type in the prediction unit, the prediction mode, and the size of the transformation unit.